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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/654,501	09/01/2000	Yuji Takahashi	PM 273792	7004

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EXAMINER
BAUMEISTER, BRADLEY W

ART UNIT	PAPER NUMBER
2815	

DATE MAILED: 06/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
09/654,501	Takahashi et al.
Examiner	**Art Unit**
B. William Baumeister	2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *Apr 21, 2003* .

2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-3, 5-13, 15-22, 25-34, and 38-50* is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-3, 5-13, 15-22, 25-34, and 38-50* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

1. Newly submitted claim 47 and 48 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

I. The previously prosecuted invention I is directed towards LEDs having fluorescent color converters, classified in class 257, subclass 79+.

II. Claims 47 and 48 are directed towards LEDs of invention I in combination with various light guide structures, provisionally classified in class 313, subclass 1+.

2. Inventions II and I are related as combination and subcombination. Inventions in this relationship are distinct if it can be shown that (1) the combination as claimed does not require the particulars of the subcombination as claimed for patentability, and (2) that the subcombination has utility by itself or in other combinations (MPEP § 806.05(c)). In the instant case, the combination as claimed does not require the particulars of the subcombination as claimed because the claims setting forth the light guide do not require particulars of the subcombination such as that the sealing member be shaped like a bullet. The subcombination has separate utility such as in a display that does not further include a linear or planar light guide.

3. Because these inventions are distinct for the reasons given above, the inventions have acquired a separate status in the art because of their recognized divergent subject matter as shown by their different classification, the search required for Group II is not required for Group I, and/or separate examination would be required, restriction for examination purposes as indicated is proper.

4. Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 47 and 48 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claim 43-45 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. While the specification discloses that plural LEDs that emit various colors may be used in conjunction with fluorescent layers that emit a different color from the plural LEDs, the specification does not disclose fluorescent converters being employed in conjunction with a set of all three red, green and blue LEDs.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 5, 15 and 29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Each of these claims recites the limitation "said leadframe." There is insufficient antecedent basis for this limitation in the claim. (The lead frame was first set forth in parent claims, such as claim 4, which have been canceled by the present amendment.)

Claim Rejections - 35 USC § 103

9. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

10. Insofar as definite, claims 1-3, 5-10, 21, 26-34, 38, 40 and 41 are rejected under 35 U.S.C. 103(a) as obvious over Soules '254 in view of Butterworth '507 and Tsutsui '536

a. Soules discloses LEDs or laser diodes that emit primary, blue light in the range of 420-470 nm (col. 3, lines 57-60). The LED is covered with a phosphor-containing polymer layer 15 and clear polymer lens 16 (e.g., FIG. 2), and both of these materials may be composed of the same material such as silicone (col. 3, lines 50-56). Various phosphors are employed so that a portion of the blue light emitted from the semiconductor device is absorbed and the phosphors emit secondary, green and red light respectively, so that the primary and secondary colors are blended to produce various colors including white light.

b. Regarding claims 8 and 32, since polymer layer 15 contains the phosphors and polymer layer 16 is composed of the same material as layer 15, but does not possess phosphors, the structure reads on a polymer layer having a step-graded phosphor profile.

c. Soules also discloses that the phosphor layer 15 is covered with a bullet-shaped sealing member 16 which are both composed of the same material, as set forth in various claims such as claims 5-7 and 9, but does not appear to mention the presence of conventional structures such as a lead frame having a cup-shaped portion. Also, while Soules sets forth that various fluorescent materials may be employed, it does not teach that any of the phosphors listed in claim 1 or 42 may be specifically employed.

d. Butterworth discloses UV/blue LEDs disposed in a cup-shaped reflector/lead frame (or box, claim 42) and which are overcoated with any of various bullet-shaped, fluorescent-dye-containing epoxies 240. One phosphor listed is the green-emitting ZnS:Cu,Al,Au (col. 3, line 54), as set forth in claims 1 and 42. Butterworth also states that depending on the implementation, some unabsorbed original blue light may also pass through the lens (col. 2, lines 64, 65) and states that multiple dyes can be employed to produce white light (i.e., also use a red dye) (col. 3, line 5). Thus, it would have been obvious to one or ordinary skill in the art at the time of the invention to dispose the device taught by Soules on a cup-shaped portion of a lead frame as taught by Butterworth for the purpose of providing a receptacle for supporting the chip and the polymer and/or for increasing the light emission efficiency by reflecting laterally-directed light upward. It would have further been obvious to one of ordinary skill in the art at the time of

the invention to have employed ZnS:Cu,Al,Au as taught by Butterworth as a fluorescent material for any of various reasons such as: (1) to obtain the particular hue associated with the specific phosphor or (2) for business reasons such as relating to the cost and availability of a particular phosphor.

e. Claims 1 and 21 have been further amended to set forth that the primary light source includes a GaN LED and includes a single reflective layer disposed on a surface of a substrate on which no light-emitter layer is formed (e.g., on the rear side of the substrate). Dependent claims 38-40 further set forth that the GaN emitter is formed on a sapphire substrate. Soules does not disclose the specific structural composition of the LED/LD that may be used nor the substrate on which the GaN emitter may be formed.

f. Tsutsui '536 discloses GaN emitters formed on sapphire substrates (e.g., col. 1) and teaches in the second embodiment (e.g., FIG 6) that the GaN chip may further possess a light reflection film 11 on the rear side of the sapphire substrate for reflecting light that is directed towards the substrate back towards the front, upper light emission surface (col. 7).

g. It would have been obvious to one of ordinary skill in the art at the time of the invention to have formed the GaN emitter of Soules on a sapphire substrate because this is the most conventionally employed substrates for growing GaN structures, as evidenced by Tsutsui. It would have further been obvious to one of ordinary skill in the art at the time of the invention to have further included a substrate rear-side reflector layer in the Soules light emitter for the purpose of increasing light extraction from the front surface as taught by Tsutsui.

11. Insofar as definite, claims 11-13, 15-20 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Soules/Butterworth/Tsutsui as applied to the claims above, and further in view of Hampden-Smith et al. '123. Soules discloses various phosphors that may be used for green and red photoluminescence, but does not appear to disclose any of the specific phosphors recited in the Markush group of claim 11 (ZnS:Eu and Y2O2S:Ce).

a. Hampden-Smith '123 teaches various sulfur-containing phosphors that can be used in an array of applications including photoluminescence (col. 35, lines 28-33). These phosphors include ZnS:Eu (paragraph spanning cols. 35-36); ZnS:Cu (Table 1, col. 37) and ZnS:Cu, Au, Al (col. 36, lines 8-15) for various hues of blue/green and CaS:Eu for red light (col. 36, line 19). It would have been obvious to one of ordinary skill in the art at the time of the invention to employ within the light emitter of Soules/Butterworth/Tsutsui, any of the phosphors specifically mentioned in Hampden-Smith for any of various reasons such as: (1) to obtain the particular hue associated with the specific phosphor or (2) for business reasons such as relating to the cost and availability of a particular phosphor.

12. Claims 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Soules/Butterworth/Tsutsui as applied to the claims above, and further in view of Thompson et al. '489 (previously made of record).

a. The cited prior art teaches blue-emitting semiconductor LEDs overcoated with downconverter phosphors as explained above, but does not disclose the device used in combination with an additional red LED.

b. Thompson teaches a full-color LED assembly comprising two LEDs and a photoluminescent downconverter phosphor disposed for re-emission of longer wavelength light in response to light that is emitted from only one of the two LEDs. The phosphor may either emit green or red light. The LED that is not in communication with the downconverter phosphor may emit red light. Through the use of the combination of an LED with a phosphor and an LED without a phosphor, different colors of light can be selectively obtained subsequent to manufacturing.

c. It would have been obvious to one of ordinary skill in the art at the time of the invention to have employed a blue LED overcoated with a green-emitting phosphor as taught by Soules/Butterworth/Tsutsui as explained above in combination with a red LED instead of an additional red phosphor for the purpose of obtaining white light emission while simultaneously enabling increased post-manufacturing color control beyond that enabled by a blue LED overcoated with green and red phosphors at least for any of the purposes of (1) providing an assembly that can selectively emit various desired colors (e.g., red, blue and green, or white); (2) enabling later color readjustment in the event that the amount of blue or green light degrades or otherwise changes over time; or (3) providing an assembly wherein the red color is not subject to color alteration attributable to phosphor degradation. Further, it would have been obvious to use

a red-emitting LED for the LED which does not produce secondary phosphor re-emission, since Soules/Butterworth/Tsutsui teach the use of down-converting phosphors (i.e., phosphors wherein higher-energy, shorter wavelength colors are absorbed and re-emitted as lower-energy, longer wavelength colors), and red is the lowest energy, longest wavelength color of blue, green and red, thereby ensuring that regardless of the assembly's configuration or the two LEDs' relative disposition, any spurious light from this second LED will not cause any significant secondary re-emission in the phosphor.

13. Claims 46, 49 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Soules/Butterworth/Tsutsui as applied to the claims above, and further in view of Komoto et al. '824 (previously made of record).

a. Komoto is directed towards GaN-based light emitters that emit preferably at wavelengths of 380 or shorter and which communicate with fluorescent materials for downconverting the primary light into various colors including white (e.g., col. 3, lines 22-). Komoto's lengthy disclosure and 141 figures include an array of information that is relevant to the present invention.

b. Regarding claim 46, regardless of whether any of the cited base references further teach that emitters may be arranged in a matrix and have a portion of said matrix being controlled by a controller, Komoto teaches that the devices may be used in a matrix for various types of displays (e.g., col. 2, lines 25-) including full color displays (e.g. col. 27, lines 1-). A full color

display implicates the presence of a controller. It would have been obvious to have employed an emission system as taught by Soules/Butterworth/Tsutsui in a matrix with a controller for the purpose of enabling their use in a full color display as taught by Komoto.

c. Regarding claim 49, regardless of whether any of the cited base references further teach that the fluorescent material may be dispersed in a layer that is formed on top of a subjacent light transmittable layer that focuses the light, this is depicted at least in the embodiment of FIG 30C (fluorescent layer 440B is formed on layer 440). It would have been obvious to one of ordinary skill in the art at the time of the invention to have formed the fluorescent layer as an overcoat, as well as in other manners (such as dispersed throughout as in FIG 30A) for the purpose of making the fluorescent layer's emission intensity more uniform as taught by Komoto.

d. Regarding claim 50, regardless of whether any of the cited base references further teach that the device may include two light transmission layers respectively including first and second materials, Komoto discloses variations of an embodiment in Figs 41-46 wherein a dipping layer (e.g., FIG 41, element 142E) includes a fluorescent material, and also discloses variations of an embodiment in FIGs 47-52 wherein a layer of fluorescent material FL is formed on top of the dipping resin layer. It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined these embodiments so as to provide distinct fluorescent materials in each of the dipping layer and the fluorescent layer for the purpose of increasing the versatility of the manufacturing process be allowing the resultant color of a given batch to be changed to a

wider array of colors by only changing or omitting the particular fluorescent material of one of the layers.

Response to Arguments

14. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

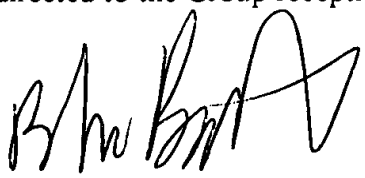
Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

INFORMATION ON HOW TO CONTACT THE USPTO

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to the examiner, **B. William Baumeister,** at **(703) 306-9165.** The examiner can normally be reached Monday through Friday, 8:30 a.m. to 5:00 p.m. If the Examiner is not available, the Examiner's supervisor, Mr. Eddie Lee, can be reached at (703) 308-1690. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.



B. William Baumeister

Primary Examiner, Art Unit 2815

June 26, 2003